



## DISK /// TECHNICAL PROCEDURES

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DISK /// TECHNICAL PROCEDURES

Appendix A

Illustrated Parts List

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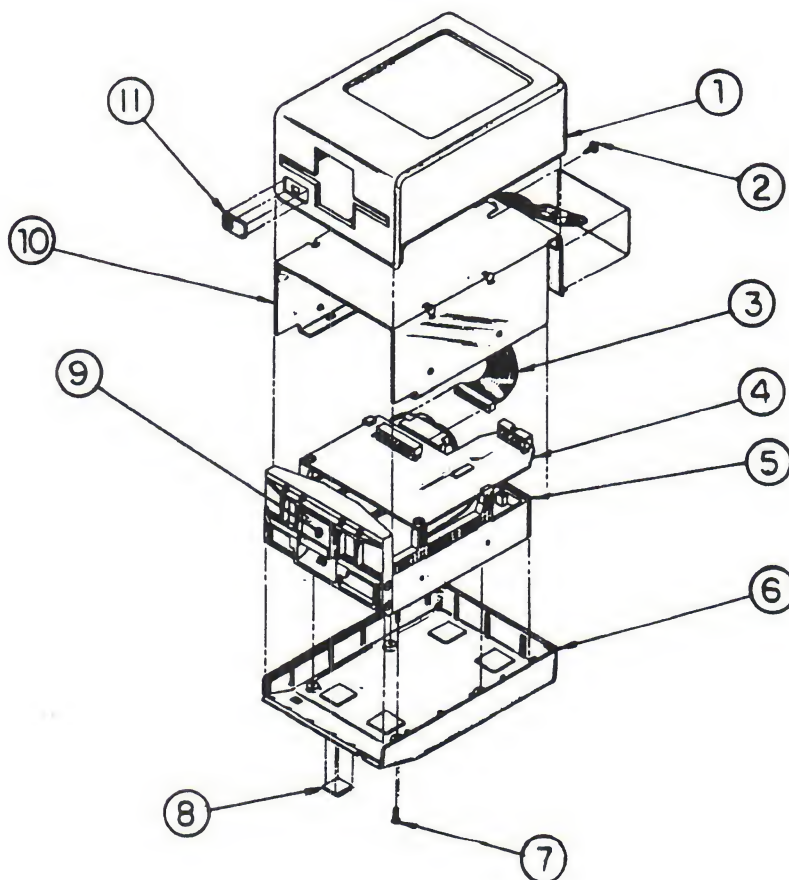
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The figures and lists below include all piece parts that can be purchased separately from Apple for the Disk /// along with their part numbers. Refer to your Apple Service Programs binder for prices.

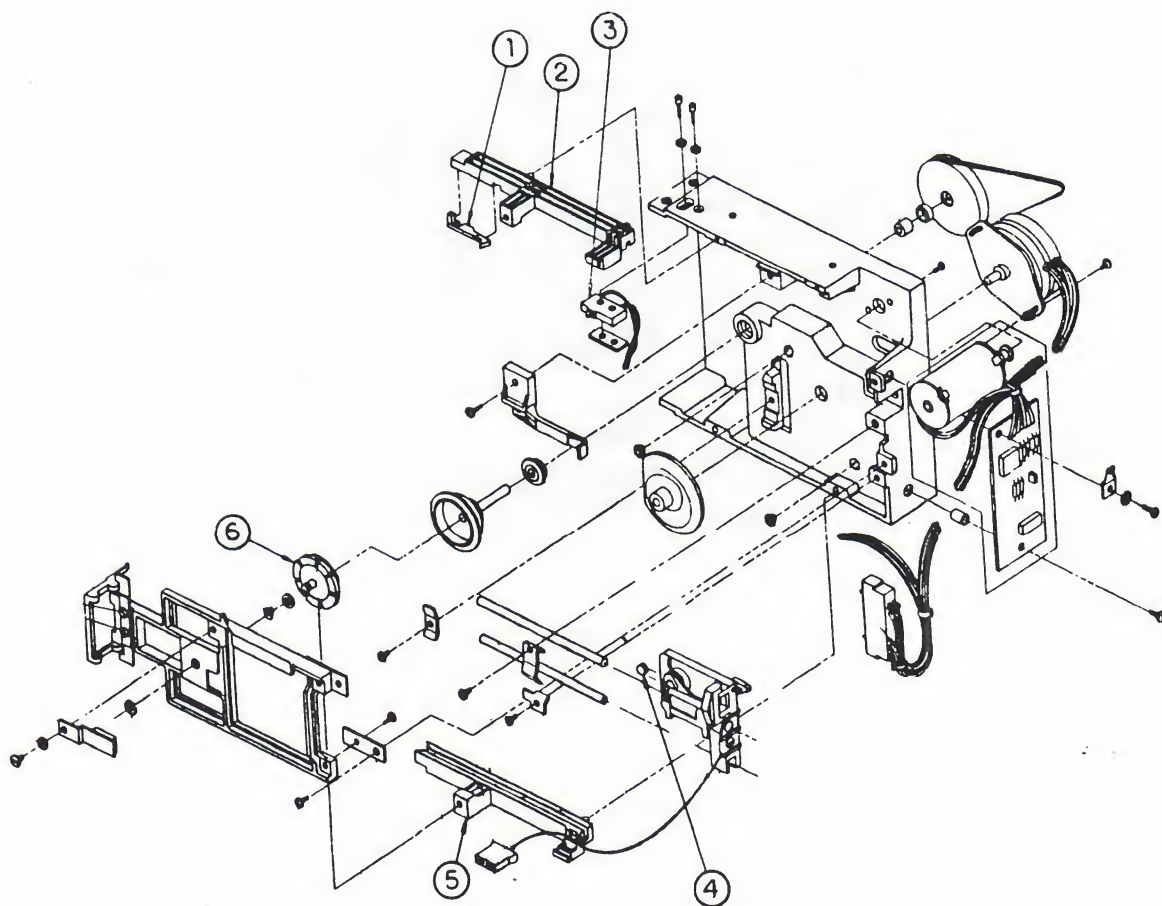
**Disk ///** (Figure 1)

Item	P/N	Description
1	815-0185	Top Cover
2	430-1001	Screw Tapping 8x18.437
3	590-0024	Cable, Ext. Disk
4	661-92002	Analog Card Apple /// Service Stock
5	661-92015	Disk Mechanical Apple /// & ext. Service Stock
6	815-0186	Bottom Cover
7	400-1606	Screw, 6-32x3/8
8	865-0001	Rubber Feet
9	815-0187	Door
10	805-0037	Shield
11	825-0069	Label Front, Disk Logo



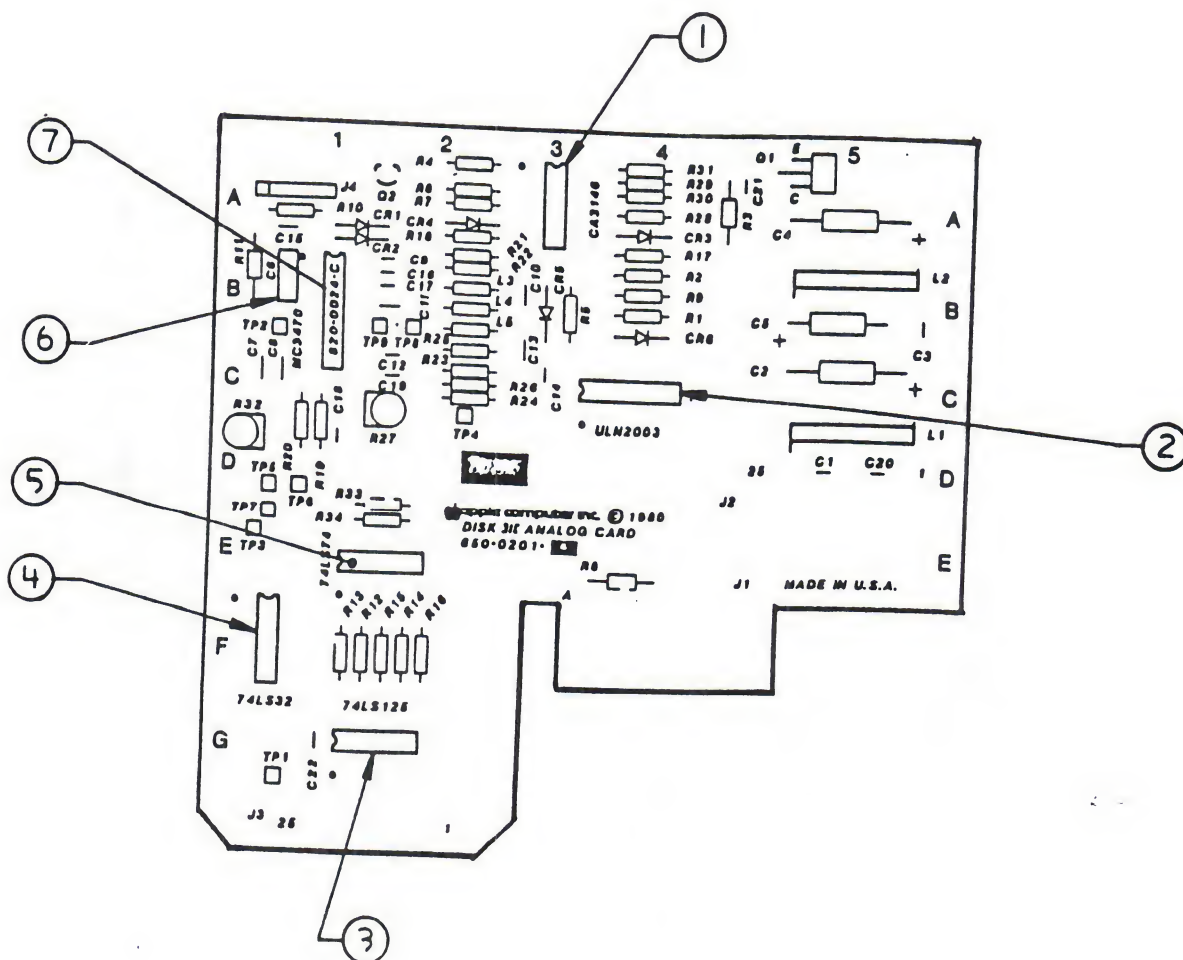
# Disk /// (Figure 2)

Item	P/N	Description
1	815-0377	Actuator Switch (Alps)
	U815-0073	Actuator Switch (Shugart)
2	815-0081	Guide, Diskette (WRT-PRT) Alps
	U815-0072	Guide, Diskette (WRT-PRT) Shugart
3	U705-0005	Write Protect Switch
4	U815-0064	Load Button
5	815-0080	Guide, Diskette (Cable) Alps
	U815-0065	Guide, Diskette (Cable) Shugart
6	U815-0067	Collect Hub



# Disk /// Analog Card (Figure 3)

Item	P/N	Description
1	351-3146	IC 3146
2	327-2003	IC 2003A
3	305-0125	IC 74LS125
4	305-0032	IC 74LS32
5	305-0074	IC 74LS74
6	125-6701	Capacitor, 470 UF, 6.3V
7	355-3470	IC MC3470





## TECHNICAL PROCEDURES

### EXTERNAL DISK DRIVE ///

#### TAKE-APART AND ADJUSTMENTS

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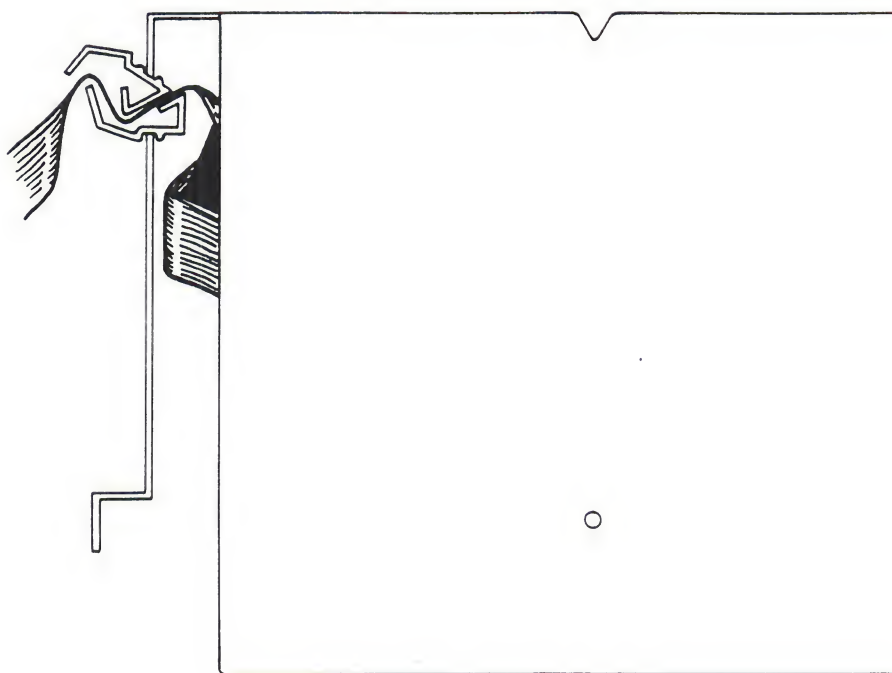




## A. INTRODUCTION

When data cannot be written to or read from a diskette in the external drive, it may mean that the drive needs adjustment. This module describes how to disassemble and adjust the drive and gives you the opportunity to practice the procedures involved. At the end of the job aid is a Disassembly/Assembly Checklist for the external Disk Drive /// (Disk ///).

The Disk /// is disassembled in three phases: first the cover, then the metal shield and ribbon cable, and finally the analog card. Assembly is just the reverse. After you disassemble the Disk ///, you will adjust or replace several parts, including Guide, Collet Hub, Head Load Button, the D-Speed and Write Protect switch. These procedures are the same as for the Disk ][.



**FIGURE 1**



## B. REMOVING THE COVER

1. Turn the power off on the Apple ///.
2. Unplug the external disk drive from the rear connector of the Apple ///. Be sure to check if there are any screws securing the connector before pulling on it. Pull by the connector rather than by the cable.
3. Unplug any other daisy-chained drives from the rear panel of the drive to be disassembled.
4. Close the disk door on front of disk drive unit.
5. Turn the drive over with the bottom-side up and remove the four Phillips screws.
6. Lift the bottom cover up from the rear and remove it. Turn the unit top side up.
7. Remove the single Phillips screw from the back panel.
8. Holding on the bottom front of the top cover, pull the cover slightly forward and up until it clears the interior parts of the drive. Set cover aside.

## C. REMOVING THE RIBBON CABLE

9. Remove the four Phillips screws holding the metal shield to the drive chassis.
10. Remove the flat cable from the back of the drive by pressing the strain relief (Figure 1) out of the slot and removing the cable. Slip a screwdriver inside the metal shield and pry down on the strain relief while simultaneously pulling down and out from outside. Be sure not to crush the cable when prying the strain relief. (Large pliers can be used to compress the strain relief enough to separate it from the mounting bracket.) The relief will come apart in two pieces. The strain relief can be a real bear, so be persistent!
11. Slide the metal shield cover back and off the drive, being careful not to pull on the cable as it is still connected to the analog card.

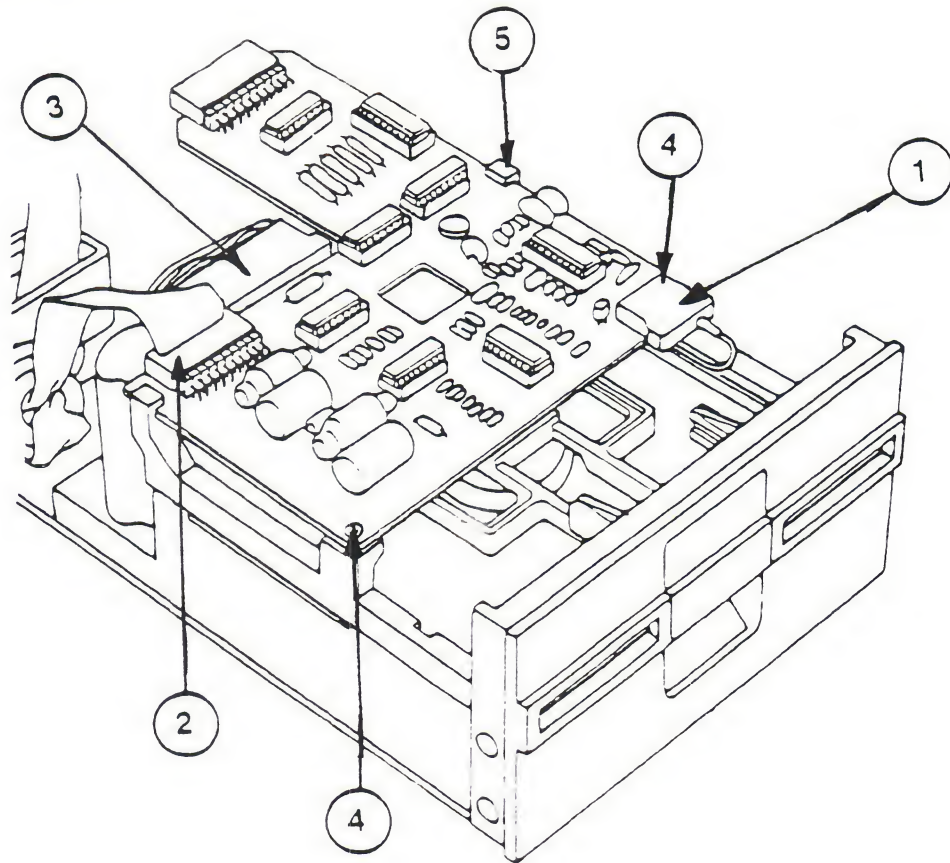


FIGURE 2

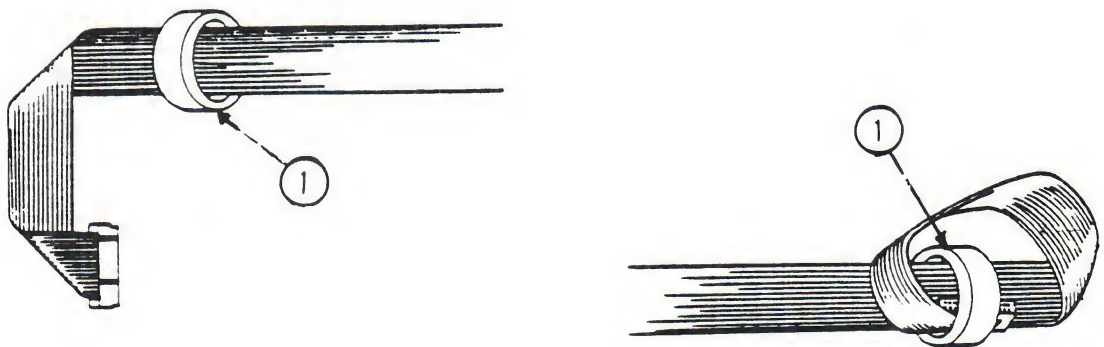


FIGURE 3



12. Lift up on the connector retainer of the board plug (Figure 2,#3) and remove the plug.
13. Remove the ribbon cable connector from the analog card (Figure 2,#2). It might be fastened very securely, so grasp the connector and pull back firmly until it disconnects. It may help to wiggle it gently back and forth as you pull back, but be careful not to bend the connector pins.
14. When replacing the ribbon cable, twist the cable connector slightly, push it through the toroids and remove the toroids from the cable (Figure 3,#1).

#### **D. REMOVING THE ANALOG CARD**

15. Remove head molex plug from front of analog card (Figure 2,#1).
16. Remove the two screws at the front of the analog card (Figure 2,#4).
17. Slide analog card forward past the retaining slots at the rear and then lift out (Figure 2,#5).

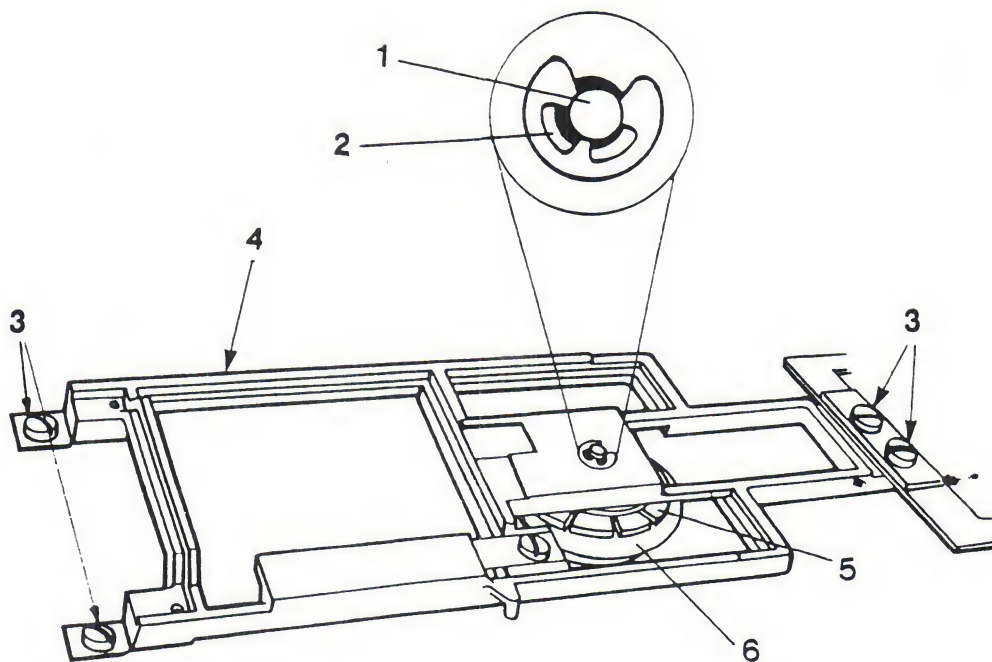


FIGURE 4

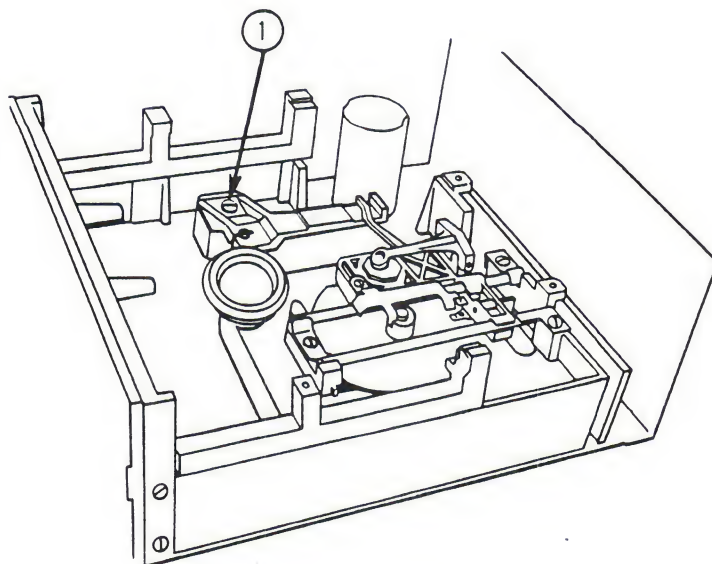


FIGURE 5

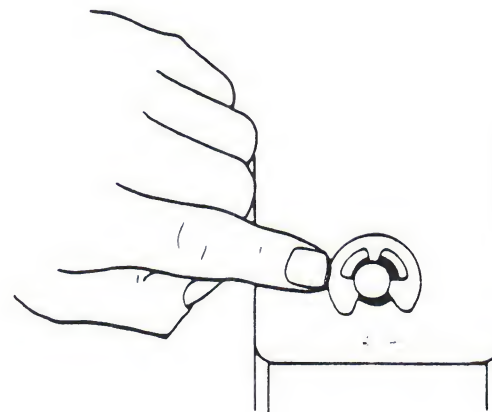


FIGURE 6

## **E. DISKETTE STOP GUIDE ADJUSTMENT**

**NOTE:** It is almost never necessary to adjust the diskette stop guide. In fact, on some models the diskette stop guide (a black plastic gadget) has been eliminated and the stop is a part of the casting itself. Still, they get tinkered with, and when they are out of adjustment, the diskette can be so far off-center that the collet hub can't find center as it seats. This damages the diskette.

1. With the Disk Adjustment Tool centered, observe the Collect Hub (Figure 4, #5).
2. If tool cannot center properly because stop guide is too far forward, loosen stop guide mounting screw (Figure 5, #1), accessible through small round hole on left side of the tool, and allow guide to move back.
3. Center tool correctly and gently close the drive door.
4. Adjust stop guide so that it touches tool, then tighten mounting screw.
5. To adjust the Collet Hub look straight down on collet shaft, (Figure 4, #1) and close door. Check to see that shaft is centered.
6. Open and close door again, to see that the collet hub moves cleanly into the center of its receptacle.
7. Loosen four screws--two on back of bracket and two that hold bracket to door (Figure 4, #3).
8. Close door, ensuring that collet hub (Figure 4, #5) is seated in its receptacle (Figure 4, #6).
9. Looking straight down on collet shaft, move bracket around until shaft is centered in hole (Figure 4, #2).
10. Tighten rear screws.
11. Check by repeating STEPS 6 and 7.
12. As a further check, open the door and then push collet shaft off-center, (Figure 6), close and open door a few time, making sure that shaft reseats itself in the center of the hole.
13. Adjust the drive door if necessary (procedure follows).

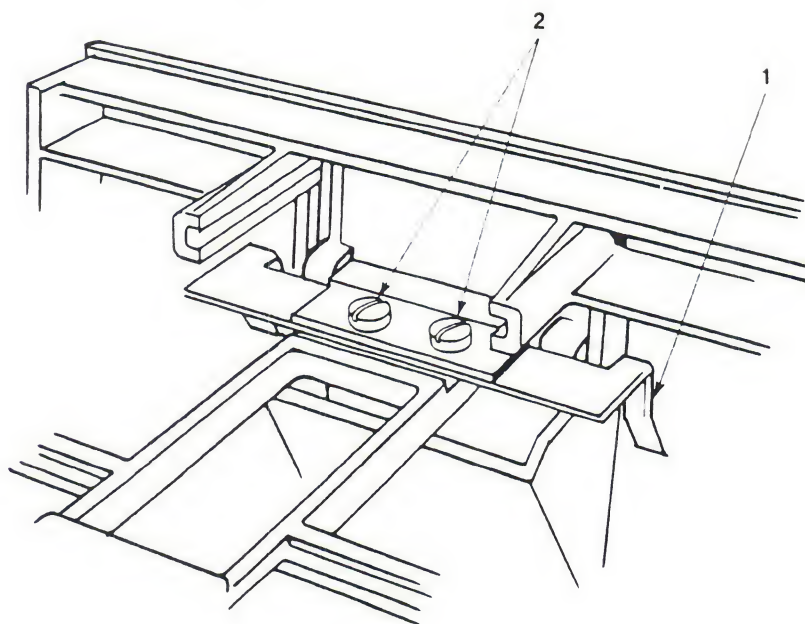


FIGURE 7



#### F. REPLACING AND ADJUSTING THE DRIVE DOOR

1. Remove two screws on each side of the front bezel (front panel) of the unit.
2. Tilt the bezel forward.
3. Remove the two screws holding the door in place and remove the door assembly.
4. Set the new door in place noting the position of the door guides (Figure 7,#1) and snug the screw to hold it in place.
5. Replace the bezel and hold it in place.
6. Insert Adjustment Tool into the drive and allow it to center properly.
7. While gently closing the drive door, observe the two guide bars (Figure 7,#1), which are visible when viewed from the back of the drive looking towards the front. There should be no binding between the guides and tool.
8. If there is binding, or if the door is crooked, tilt the bezel forward just enough to be able to loosen the two screws that hold the door in place. Make sure the two plastic protrusions on the top of the door fit into the two plastic guides on the bezel and that the door looks centered.
9. With the bezel tilted forward, tighten the two screws to hold the door into position.
10. Put the bezel into its normal position and replace the four screws to hold it.

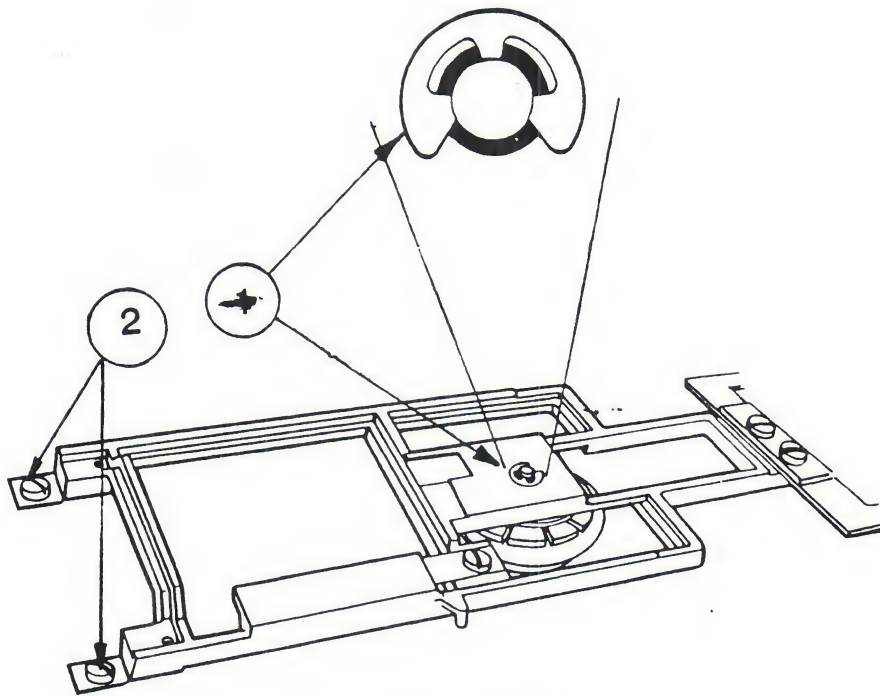


FIGURE 8

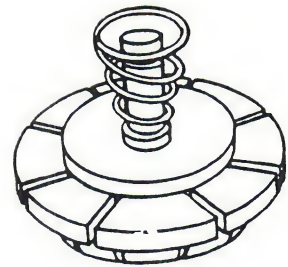


FIGURE 9

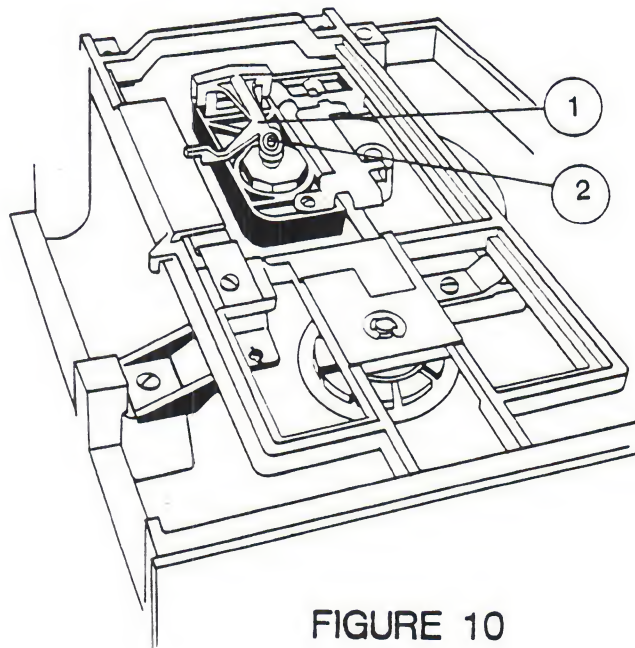


FIGURE 10



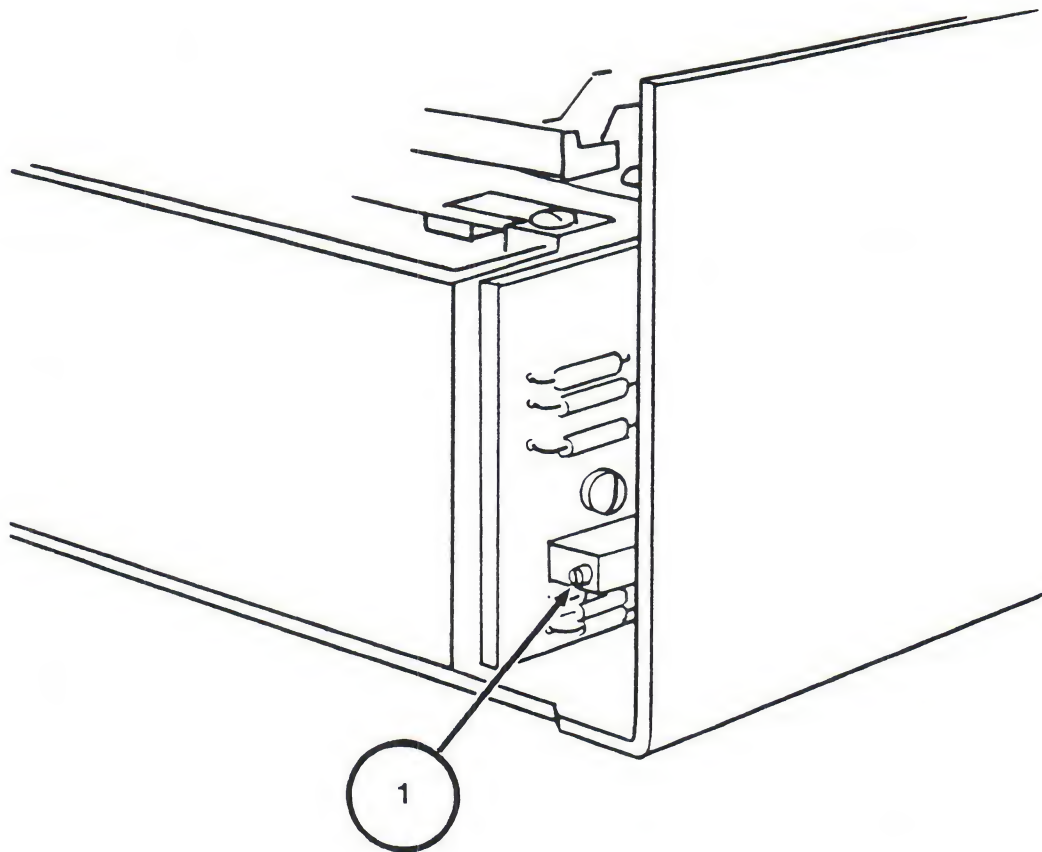
#### G. REPLACING THE COLLET HUB

1. Open the drive door.
2. Remove the two screws at the rear of the assembly (Figure 8,#2) that hold the bracket in place and remove it.
3. With a screwdriver pry the retaining clip (Figure 8) from the shaft holding the collet.
4. Remove the collet hub assembly and retain the spring and washer (Figure 9). Remove spring carefully, taking care not to stretch it.
5. Place the washer and spring on the new collet shaft--the spring goes on small end down--and insert into the mounting arm.
6. Install the retaining clip.
7. Set the bracket into position (Figure 8), making sure the two plastic protrusions on the top of the door slide into the guides on the bezel.
8. Push down on the collet hub to make sure it is centered, then secure the two screws to hold the bracket in place (Figure 8,#2).

#### H. REPLACING THE HEAD LOAD BUTTON

NOTE: Some Head Load Buttons are glued. If the glue cannot be broken, sent the unit to Level 2 for servicing.

1. Lift the Head Load Arm up (Figure 10,#1) and squeeze the top part of the load button (Figure 10,#2) with thin needle-nose pliers and drop button down.
2. Install a new load button by inserting it into the holder and pushing up until it snaps in place.



**FIGURE 11**



## I. ADJUSTING THE SPEED -- THE D-SPEED TEST

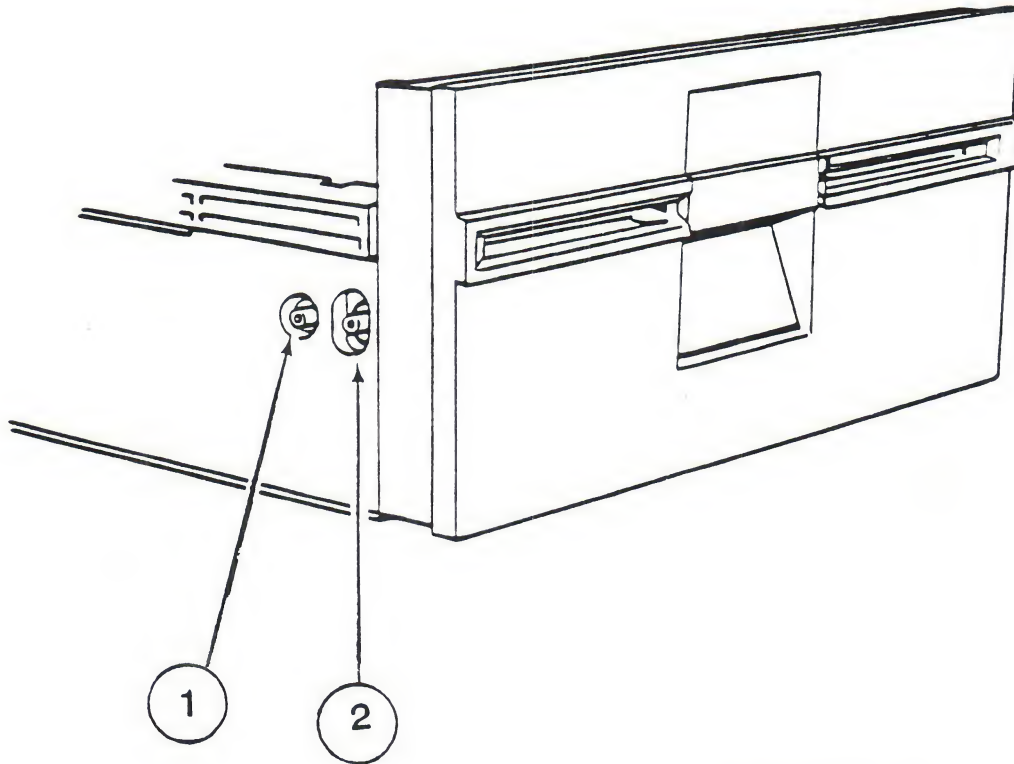
1. Check that the power to the Apple /// is off.
2. Place the Apple ][ Emulation diskette in the internal drive (assuming it is working properly) and boot it up by turning the power on.
3. To the prompt "Boot Apple ][ Disk", place the Disk Alignment Aid diskette in the internal drive and hit return.
4. When the menu comes up, SET TARGET DISK will be highlighted. Accept it by pressing **A**.
5. Set target for drive 6, slot 2, by pressing **SAA**. Press **ESC**.
6. Select **DSPEED** test (press **SSSA**).
7. The screen will warn you that the test will write on the diskette. Put your scratch (or a blank formatted) diskette in the target drive and press **A** again.

**NOTE:** At this point, the screen should show a scale with -100 on the left and +100 on the right, with a marker indicating the relative speed of the drive.

8. Look at the back of the drive mechanism. Locate the Motor Control Card, mounted on the edge, and note the small grey helipot with a screwdriver adjustment on the side (Figure 11,#1).

**NOTE:** Do not confuse this with the helipot(s) on the analog card!

9. With a small flatblade screwdriver adjust the helipot and note how the indicator on the screen moves back and forth, showing changes of speed.
10. Set the speed so that it indicates between -5 and 0.



**FIGURE 12**



## J. WRITE PROTECT SWITCH ADJUSTMENT

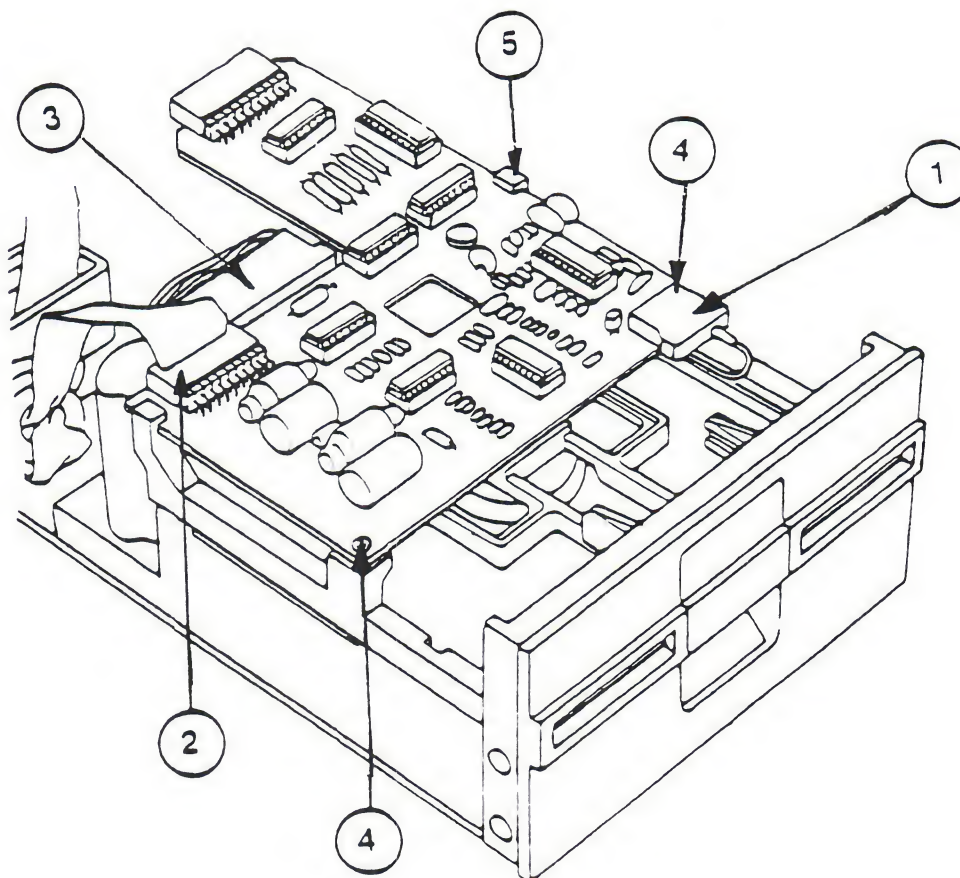
1. Using the same set-up you had for the previous exercise, select WRT PROTECT SWITCH.
2. Note the two setscrews holding the write-protect switch in place (Figure 12,#1 & 2). The switch is located on front left side of housing as you face drive door. The far setscrew, (Figure 12,#1), forms a pivot for switch; the near setscrew (Figure 12,#2), sets switch position.
3. Insert Disk-Adjustment Tool all the way and leave the disk drive door open.

**NOTE:** Some drives will scrape on the adjustment tool. If you have one that does, use a diskette instead of the tool.

4. Loosen the rear setscrew, then loosen the front setscrew and raise up on it (Figure 12,#2) until the switch disables, and tighten setscrew.
5. Tighten rear setscrew (Figure 12,#1).
6. Check by withdrawing Adjustment Tool to the Slot 1 position. Switch should be enabled.

**NOTE:** If switch continues to show a disabled condition, reboot and try the procedure again.

7. Verify again, using Adjustment Tool in both Slot 1 and Slot 2 positions.



**FIGURE 13**



**FIGURE 14**



## ASSEMBLING Disk ///

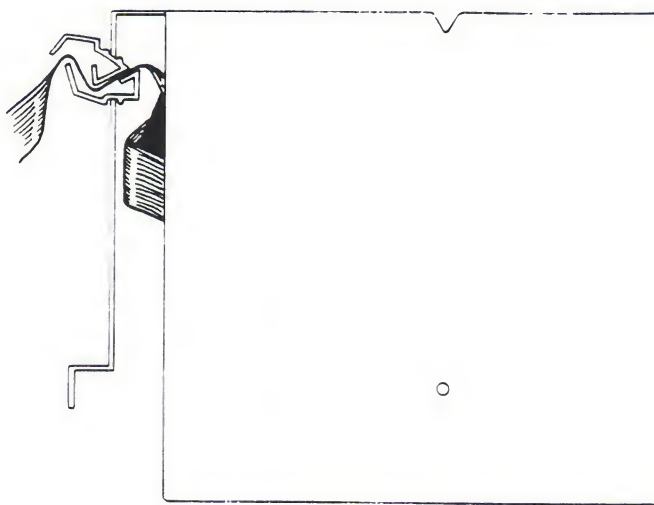
### K. REPLACING THE ANALOG CARD

1. Slide the analog card through the retaining slots (Figure 13,#5) and into position.
2. Replace two screws to hold board in place (Figure 13,#4).
3. Attach the head molex plug to the front of the analog card (Figure 13,#1). Ensure that there is just enough loop in the cable so that it doesn't pull down on the head molex plug.

### L. REPLACING THE RIBBON CABLE

4. Place the two toroids onto one end of the replacement cable looping the cable through the toroids and leaving about 3 inches of cable between the toroids and the connector (Figure 14).
5. Place the cable just above the toroids into the nylon cable holder and snap the holder shut.
6. Attach the ribbon cable connector to the analog card, making sure that both rows of pins align with the holes in the connector (Figure 13,#2).
7. Attach the analog card board plug at the end of the analog card (Figure 13,#3). The gripper of the retainer will slip into the hole when it is in place.

8. Replace the strain relief guard at the back of the metal shield. Fit the guard as close as possible to the toroid while leaving yourself enough cable to work with. Make an "S" in the cable right next to the metal shield. Fit the bottom portion of the "S" into the one part of the strain relief with the triangle side fitting inside the metal shield. The other part of the strain relief fits with the triangle against the cable and into the lower portion of the strain relief. The top part then slips inside the metal shield (Figure 15).
9. Replace the four screws on the side of the metal shield.



**FIGURE 15**

#### **M. REPLACING THE COVER**

10. Replace the top cover. With the unit top side up, set cover over back edge of Disk /// then pull the cover slightly forward as you slide it down over the disk drive door.
11. Replace the single Phillips screw on the back panel.
12. Turn the drive over and replace the bottom cover.
13. Replace four Phillips screws and turn drive top side up.
14. Reconnect any daisy-chained drive on the rear panel of Disk ///.
15. Reconnect Disk /// on the rear panel of the Apple ///.



## N. DISASSEMBLY/ASSEMBLY CHECKLIST

### Disassembly Procedures

- \_\_\_ 1. Turn the Apple ///'s power off.
- \_\_\_ 2. Unplug the disk drive from the rear connector of the Apple ///.
- \_\_\_ 3. Unplug any other daisy-chained drives from the rear panel of the drive to be repaired.
- \_\_\_ 4. Remove disk drive cover.
- \_\_\_ 5. Remove strain relief.
- \_\_\_ 6. Remove metal shield.
- \_\_\_ 7. Disconnect head molex plug, board plug and ribbon cable connector from the analog card.
- \_\_\_ 8. Remove analog card.

### Adjustments

- \_\_\_ 1. Replace/Adjust disk drive door.
- \_\_\_ 2. Adjust diskette stop guide.
- \_\_\_ 3. Replace collet hub.
- \_\_\_ 4. Replace head load button.
- \_\_\_ 5. Adjust the speed.
- \_\_\_ 6. Adjust write protect switch.

### Assembly Procedures

- \_\_\_ 1. Replace analog card.
- \_\_\_ 2. Connect head molex plug, board plug, and ribbon cable connector on the analog card.
- \_\_\_ 3. Replace metal shield.
- \_\_\_ 4. Replace strain relief.
- \_\_\_ 5. Replace disk drive cover.
- \_\_\_ 6. Connect any daisy-chained drives to the rear panel of the drive.
- \_\_\_ 7. Connect the disk drive to the rear connector of the Apple ///.





DISK /// TECHNICAL PROCEDURES

SECTION 2

ANALOG CARD REPAIR

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## Introduction

The following pages outline the Level 1 repair procedures for the Disk /// disk drive analog card, which is used in the Apple /// Personal Computer. In order to thoroughly test the analog card, follow **ALL** of the procedures in this section. Doing this will ensure that no potential problems are overlooked.

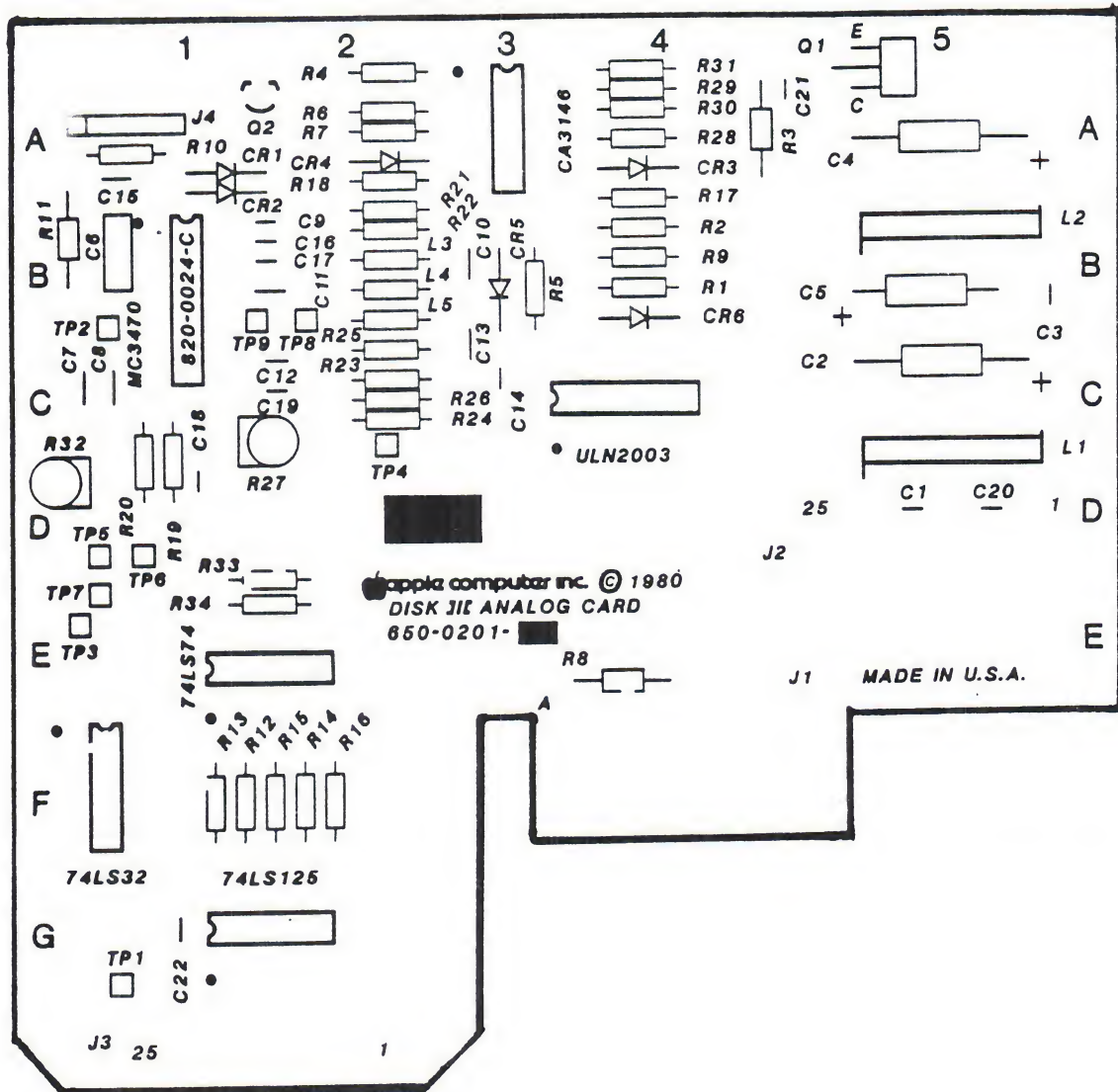
## Materials Required:

Apple /// Personal Computer  
External Disk ][ or /// mechanical assembly  
External Disk /// Interface cable  
Disk Alignment Aid diskette (Apple p/n: 652-0199)  
Apple ][ Emulation diskette (Apple p/n: 681-0002)  
Copy of DOS 3.3 System Master diskette (non-write protected)  
Copy of Business Basic diskette (Apple p/n: 681-0005)  
Blank diskette  
Small jewelers' screwdriver

### Replacement ICs (one each):

74LS125 (Apple p/n: 305-0125)  
2003 (Apple p/n: 327-2003)  
3470 (Motorola) (Apple p/n: 355-3470)  
3146 (Apple p/n: 351-3146)  
74LS74 (Apple p/n: 305-0074)  
74LS32 (Apple p/n: 305-0032)

**CAUTION:** Be sure to turn off the power to the computer before replacing any of the components on the analog card.





## System Setup

For the analog card to be correctly diagnosed, it must be the only unknown variable in the test system. Using all known-good, verified components, assemble them as follows:

1. Place the analog card to be tested on the external drive mechanical assembly and connect the mechanical assembly cable and head cable.
2. Connect the external cable between the analog card and the external drive port.

## Visual Inspection

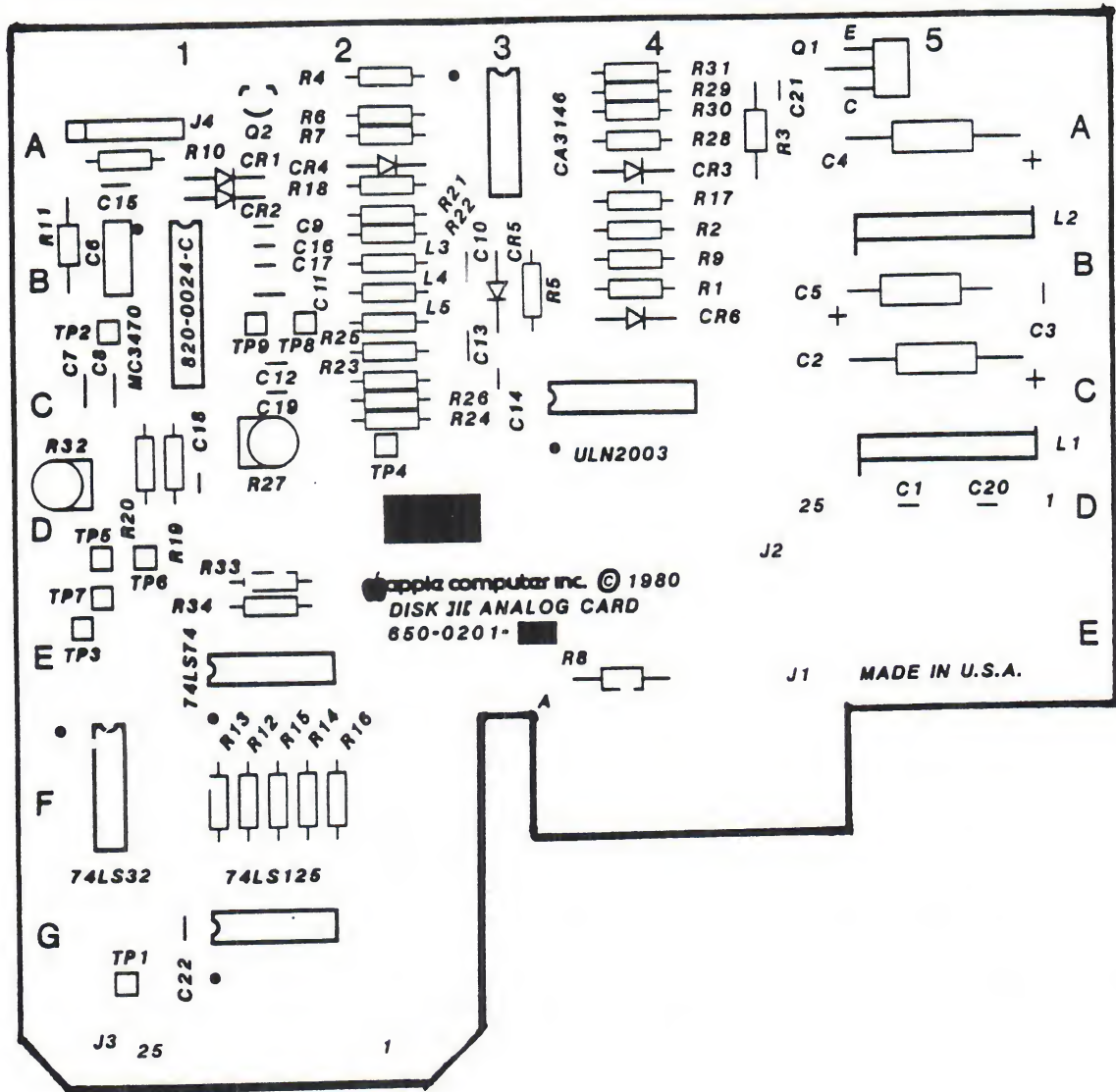
Inspect the analog card for out-of-date versions or signs of PCB (Printed Circuit Board) reworking, such as:

- a. R 32 (location D1) is missing
- b. The IC at location E1 is missing
- c. Jumper wires soldered to the back of the PCB

Return all analog cards with any of the above configurations to Apple. Next, examine the suspect analog card for visual signs of damage. This may take one of several forms:

1. Burned or melted ICs or sockets. Remove each of the six ICs and closely examine them and the sockets. Replace all damaged ICs with good ones. Return all analog cards with damaged sockets to Apple.
2. Capacitor C4 (large capacitor at corner of card) may be visibly damaged (burned, exploded, melted). These cards should be returned to Apple for repair.
3. Components other than the six ICs may be physically damaged and in need of replacement. These cards should be returned to Apple for repair.

**WARNING:** Do not use an eraser to clean gold contacts. Use only a liquid or spray contact cleaner and a clean cloth.





## Troubleshooting

A malfunctioning analog card may manifest symptoms in one of five ways:

- Drive 1 will not boot (with bad external drive analog card connected).
- Drive will not read or write (could destroy data).
- Drive has trouble reading.
- Drive has trouble writing.
- Diskette-switched circuit malfunctions.

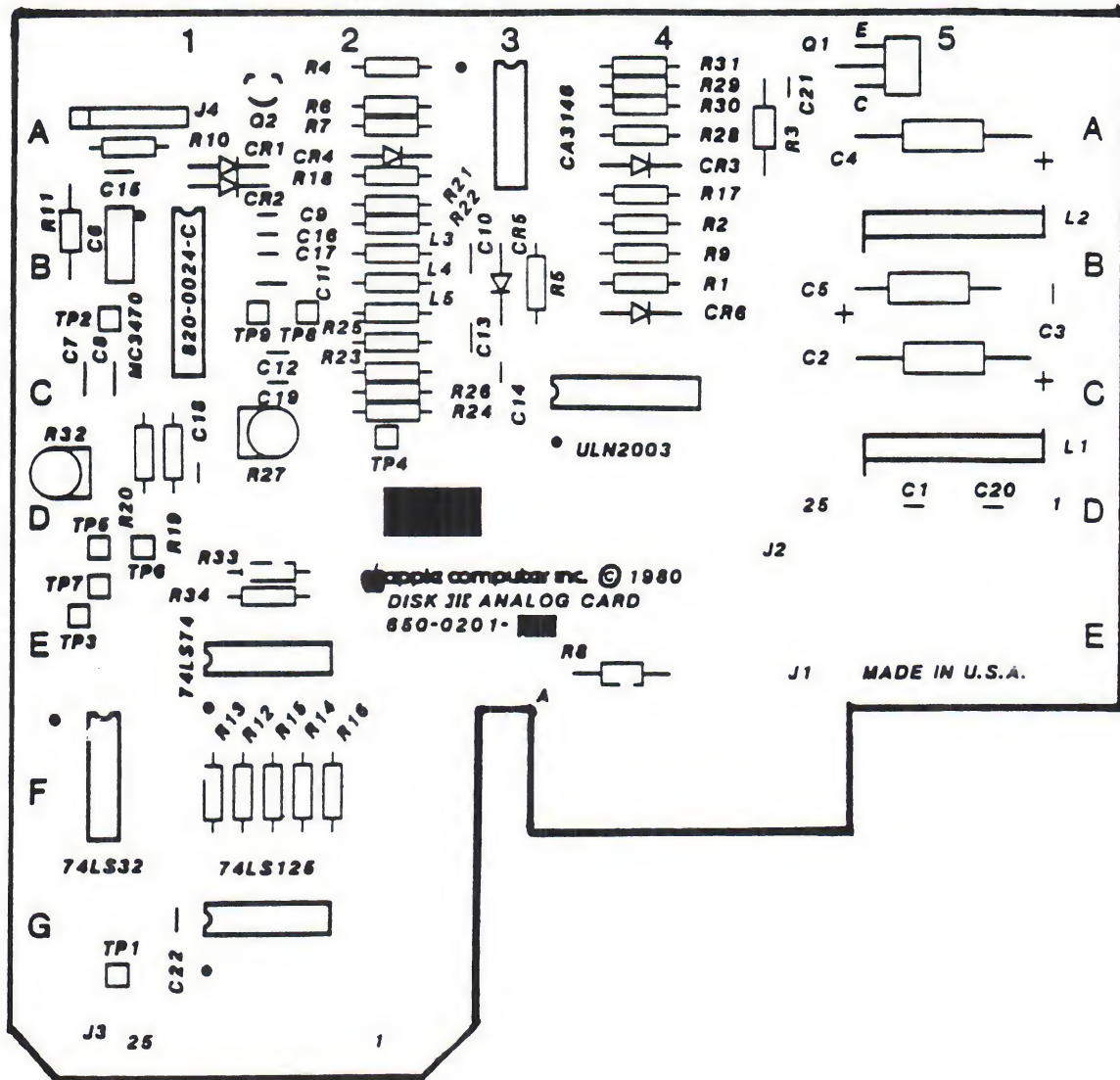
A troubleshooting procedure for each failure mode follows.

### System Will Not Boot

It is possible that an analog card can be damaged in such a way that when it is mounted on the external drive, it keeps the internal drive from booting normally. To test for this condition:

1. Mount the analog card to be tested on the external drive mechanical assembly and connect the cables from the mechanical assembly, the read/write head, and the external drive connector on the computer.
2. Place the Apple ][ Emulation diskette in the internal drive and turn on the power to the computer. The Emulation display will appear on the video screen. If the diskette does not boot, turn off the power to the computer and replace the following devices, one at a time, repeating this step after each until the diskette boots.
  - IC at C4 (labelled 2003)
  - IC at G2 (labelled 74LS125)
  - IC at A3 (labelled CA3146)
  - IC at B1 (labelled 3470)
  - IC at E2 (labelled 74LS74)

If the emulation diskette still fails to boot, place all original ICs in their sockets and return the analog card to Apple.

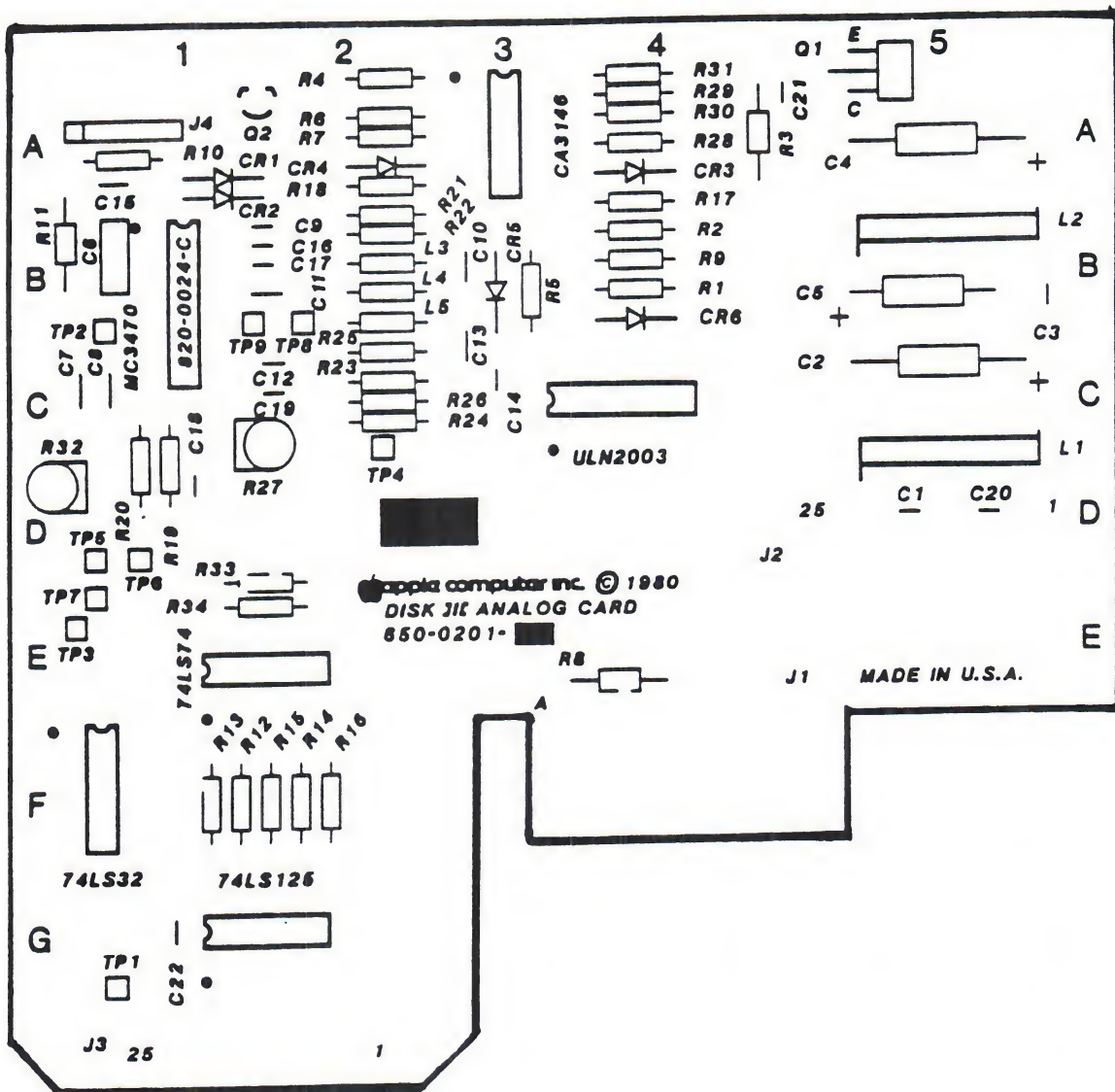




## Drive Will Not Read or Write

If the emulation diskette boots successfully in the internal drive, perform the following steps:

1. Place the Disk Alignment Aid diskette in the internal drive and a good blank diskette in the external drive and press <RETURN>. The Disk alignment Aid diskette should boot and display the menu on the screen.
2. Press the A key. The video screen will display the **SET TARGET DISK** menu.
3. Press the S key to highlight the **SET DRIVE** selection.
4. Press the A key to select **SET DRIVE** option.
5. Press the A key to accept the external drive as the target drive.
6. Press the **ESCAPE** key to return to the main menu.
7. Press the S key until **DSPEED** is highlighted.
8. Press the A key to accept the **DSPEED** test.
9. Press the A key to begin the **DSPEED** test. The video screen will display a scale with the high, low and current disk speed values. Locate the speed adjustment screw on the motor control PCB at the right rear of the mechanical assembly. Adjust this pot while observing the current speed value and indicator (arrow). If the value changes and the arrow moves as you turn the adjustment, this portion of the circuit is functional; proceed to the **Drive Has Trouble Reading** procedure. If the drive speed indicator does not move to reflect the speed adjustment, this circuit is faulty; turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the indicator moves reflecting the speed changes:
  - IC at B1 (labelled 3470)
  - IC at A3 (labelled 3146)
  - IC at G4 (labelled 74LS125)
  - IC at C4 (labelled 2003)
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)





If you replace all of the ICs on the analog card and the DSPEED indicator still fails to move, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the adjustment procedures of the Disk ][ Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.

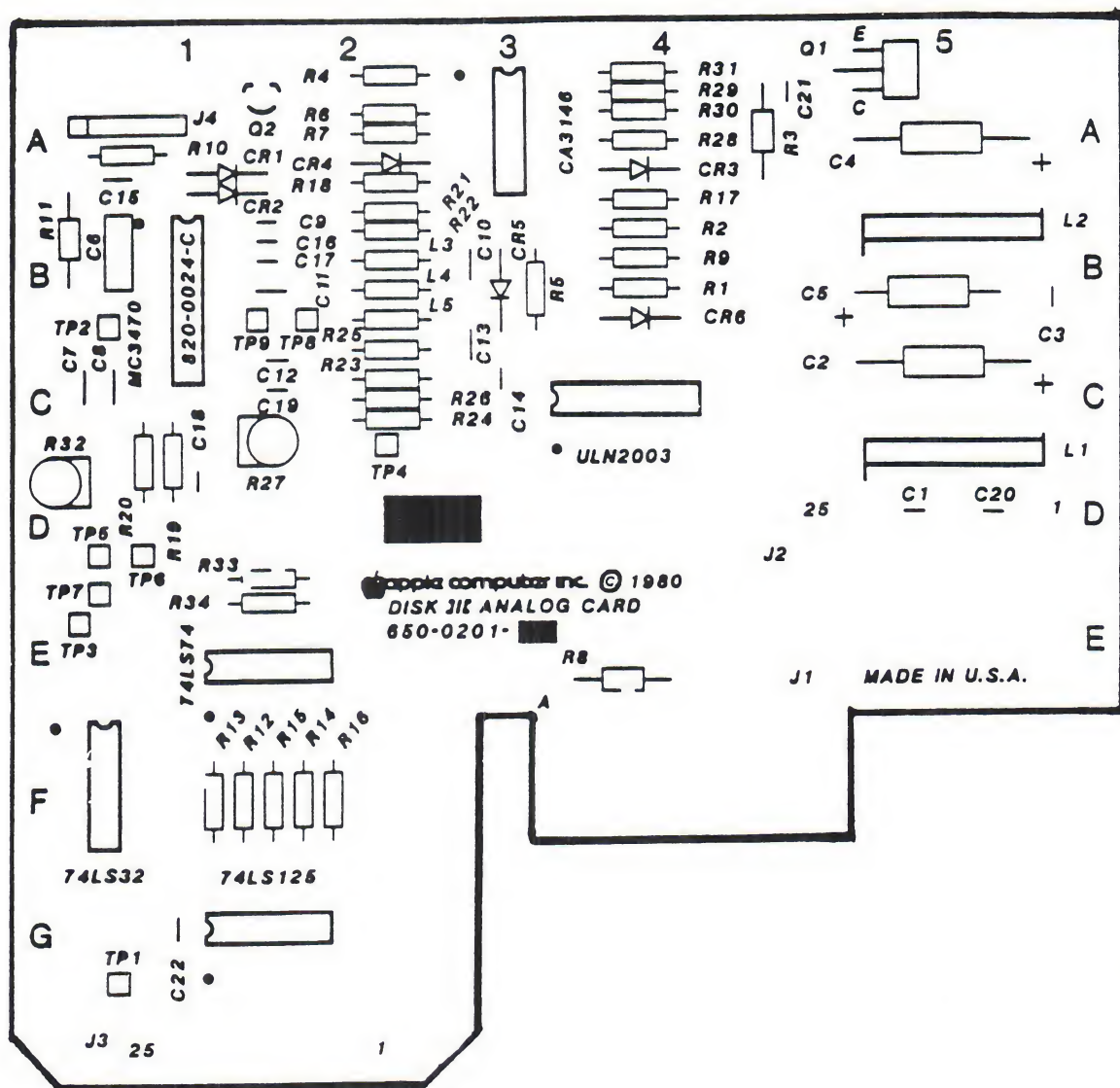
### Drive Has Trouble Reading

If the drive will perform the DSPEED test successfully, perform the following steps:

1. Boot the Apple ][ Emulation diskette in the internal drive.
2. Once the Apple ][ Emulation menu appears on the screen, complete the boot process by placing the DOS 3.3 System Master diskette in the internal drive and pressing **<RETURN>**.
3. Move the DOS 3.3 diskette to the external drive.
4. Type **CATALOG,D2**, press **<RETURN>** and watch the external drive closely for activity. The video screen should display the catalog of the DOS 3.3 System Master diskette. If this does not occur, replace the following devices according to the observed symptoms:

<u>SYMPTOM</u>	<u>IC</u>	<u>LOCATION</u>
IN-USE light off	74LS32	F1
" "	74LS125	G2
" "	2003	C4
" "	74LS74	E2
Motor off, IN-USE light on	74LS32	F1
Head does not move	2003	C4
Head moves erratically	2003	C4
Recalibrates repeatedly	3470	B1
I/O ERROR	3470	B1
" "	3146	A3
" "	74LS125	G2
" "	2003	C4
" "	74LS32	F1
" "	74LS74	E2

If you have replaced all of the ICs on the analog card and the catalog still does not appear on the monitor, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk ][ Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.





## Drive Has Trouble Writing

If the analog card correctly displays the catalog of the external drive, perform the following steps:

1. Type **CATALOG,D2** and press <RETURN>. The catalog will be displayed on the video screen. Files displayed with an asterisk (\*) preceding the filename are locked and may not be deleted. Note that filename HELLO is preceded by an asterisk.
2. Type **UNLOCK HELLO** and press <RETURN>.
3. Type **CATALOG** and press <RETURN>. The catalog will be displayed on the video screen. Verify that filename HELLO is not preceded by an asterisk. If you encounter trouble when attempting to unlock the file, turn off the power to the computer and replace the following devices (except those which have been replaced previously), one at a time, repeating this test after each device until the UNLOCK command executes successfully:

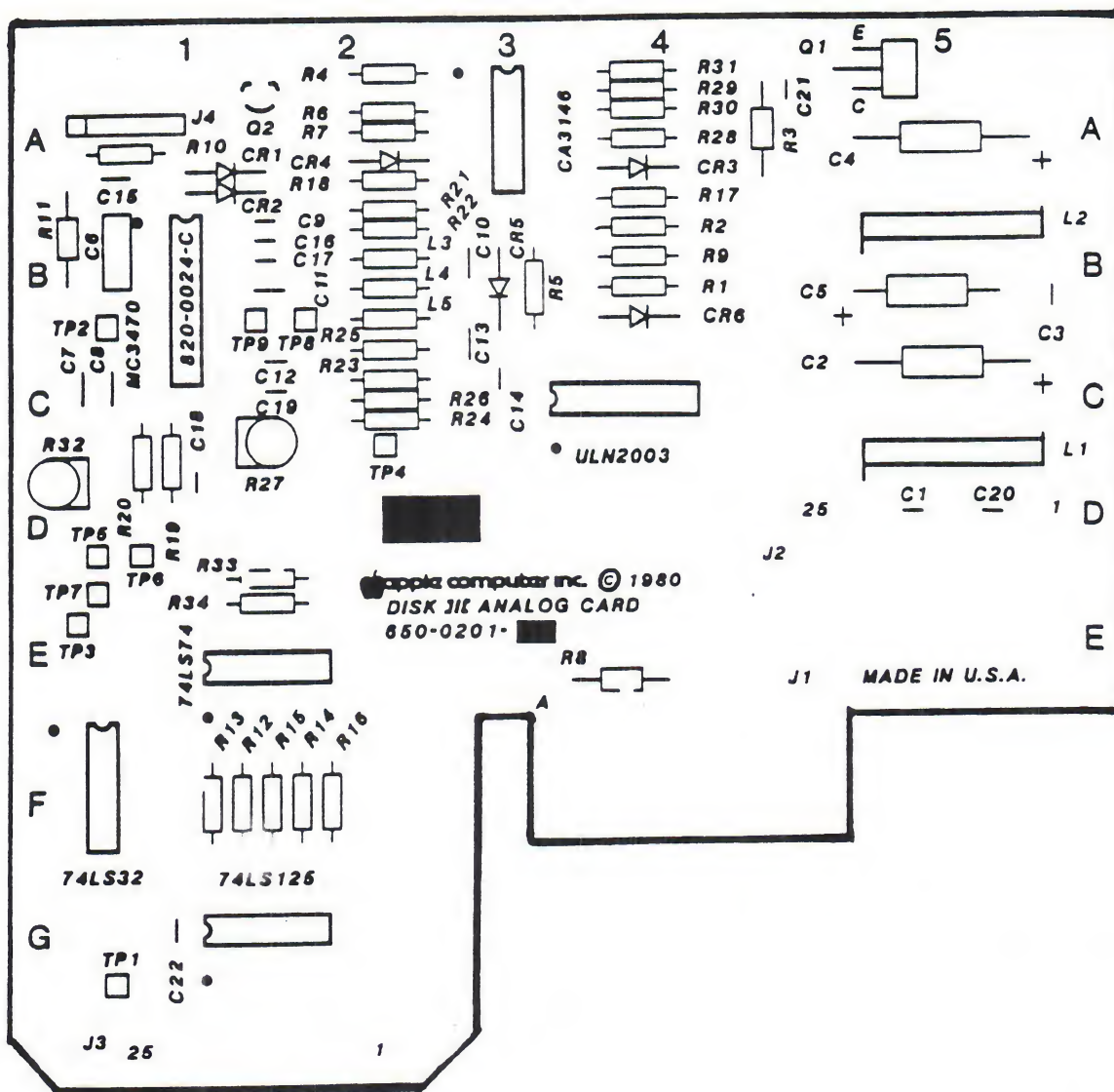
<u>SYMPTOM</u>	<u>IC</u>	<u>LOCATION</u>
I/O ERROR	3470	B1
" "	3146	A3
WRITE PROTECTED error	74LS125	G2
" "	74LS74	E2
Recalibrates Repeatedly	3470	B1

4. Type **LOCK HELLO** and press <RETURN> to re-lock the file.

If you have replaced all of the ICs on the analog card and you still experience trouble, perform the **COMPARATOR OFFSET ADJUSTMENT** located in the calibration procedures of the Disk ][ Technical Procedures section. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next procedure.

## Write-Protect Switch Circuit Malfunctions

1. Place a write-protect tab on the DOS 3.3 System Master diskette and insert the diskette back in the external drive.





2. Repeat steps 2 and 3 above (in the **DRIVE HAS TROUBLE WRITING** procedure). The video screen should display **WRITE PROTECTED** error. If this does not occur, replace the following device (unless it has been replaced previously) according to the symptom listed, and repeat this test.

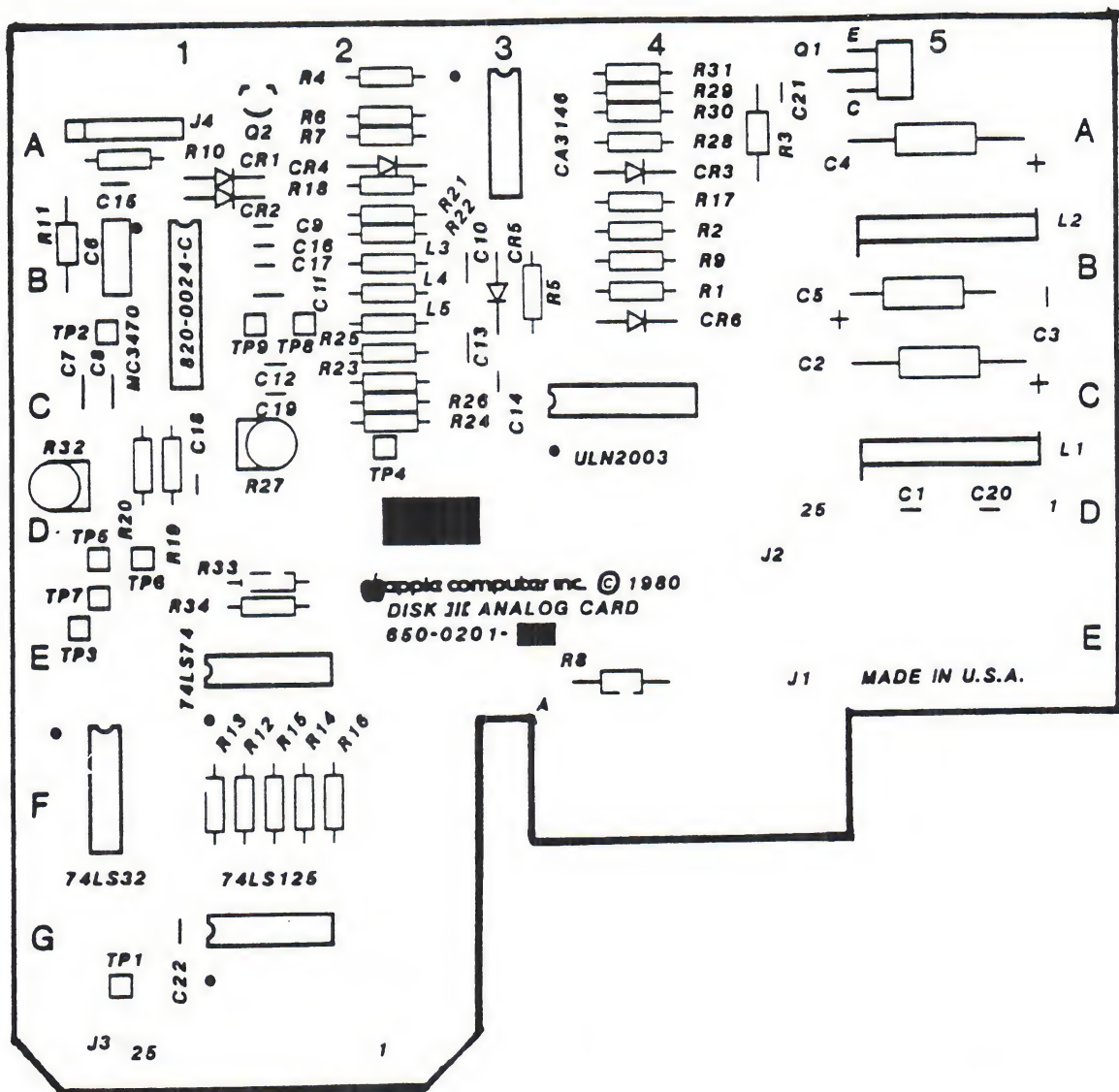
<u>SYMPTOM</u>	<u>IC</u>	<u>LOCATION</u>
File remains locked	74LS125	G2
" "	74LS74	E2
I/O ERROR	74LS125	G2
" "	74LS74	E2
" "	74LS32	F1

If the screen still does not display **WRITE PROTECTED** error, place all original ICs in their sockets and return the analog card to Apple.

### Diskette-Switched Circuit Malfunctions

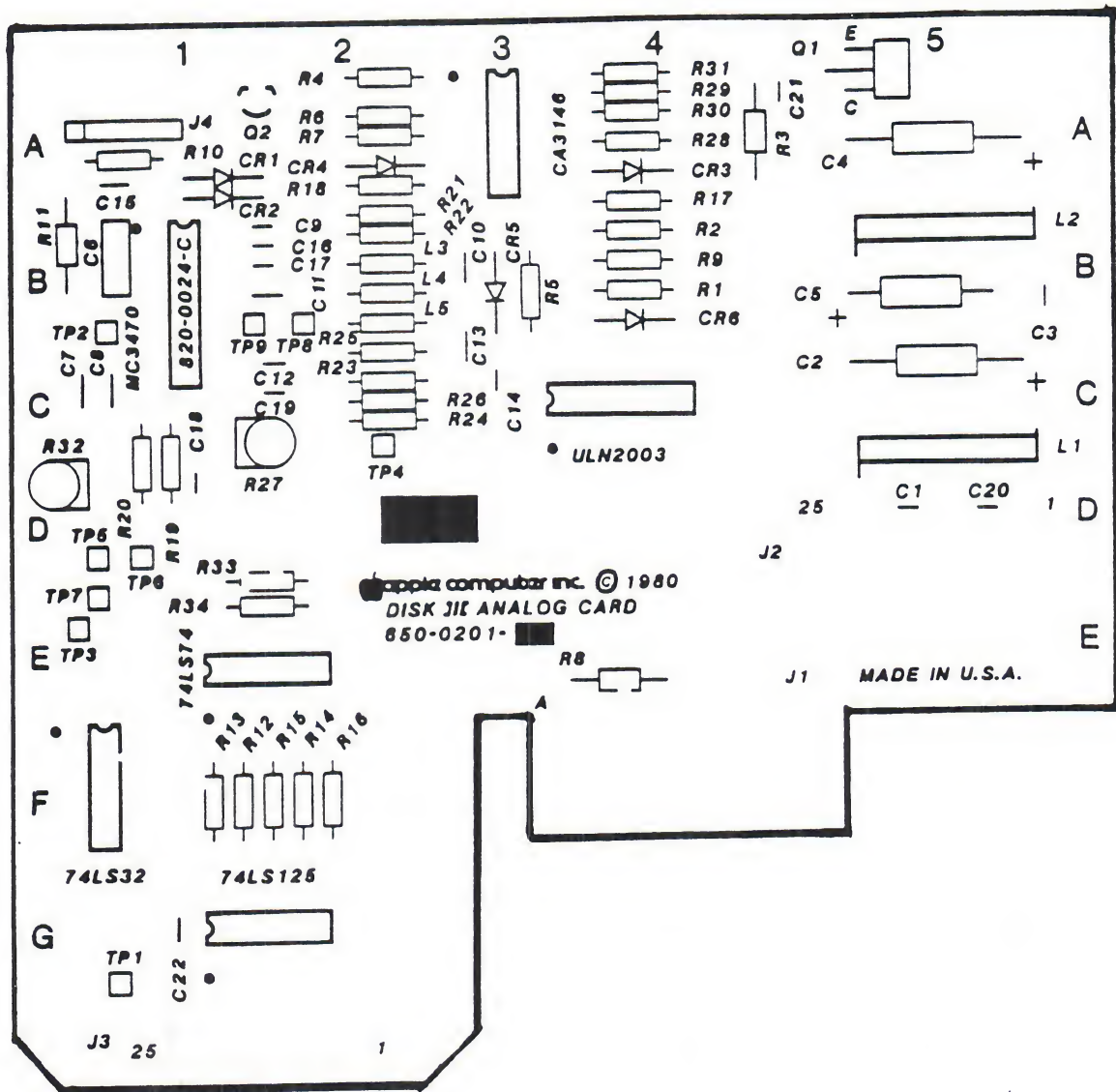
The diskette-switched circuit detects the changing of the diskette. Due to the difference in the way the computer reads the directory in Apple // Emulation mode, this circuit must be tested in Apple ][ Emulation mode as well as Apple /// mode.

1. Boot the Business Basic diskette in the internal drive and then move it to the external drive.
2. Type **CATALOG .D2** and press **<RETURN>**. The disk catalog will display on the video screen.
3. Rest the eraser end of a common pencil lightly on the cam of the external drive mechanism and hold it there while carefully observing it. Type **CATALOG .D2** again and press **<RETURN>**. Watch the drive cam for movement; you should **NOT** feel the pencil move at all. If the cam does move at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)
4. Remove the diskette from the external drive and re-insert it.





5. With the pencil eraser resting on the drive cam, type **CATALOG .D2** and press **<RETURN>** and observe the cam for movement; you SHOULD feel the pencil move. If the cam does not move at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)
6. Repeat step 5 (above). This time, the cam should NOT move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple. Otherwise, go on to the next step.
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)
7. Boot the Apple ][ Emulation diskette by placing it in the internal drive and turning on the power to the computer. The Emulation display will show on the video screen.
8. Remove the Apple ][ Emulation diskette and boot the DOS 3.3 System Master diskette by inserting it in the internal drive and pressing **<RETURN>**. Once it has booted, move it to the external drive.
9. Type **CATALOG,D2** and press **<RETURN>**. After the catalog is displayed, press **<RETURN>**. the Applesoft prompt (|) will appear on the video screen.
10. Place the pencil eraser on the drive cam. Type **CATALOG** again and press **<RETURN>**. The cam should NOT move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)





11. Remove the DOS 3.3 System Master diskette from the external drive and replace it in the same drive. Repeat step 10 (above) and check that the cam does NOT move. If the cam moves at all, replace the following devices (unless they have been replaced previously) one at a time, and repeat this test. If the analog card still fails to function properly, place all original ICs in their sockets and return the card to Apple.
  - IC at E2 (labelled 74LS74)
  - IC at F1 (labelled 74LS32)





## Disk Drive /// Technical Procedures

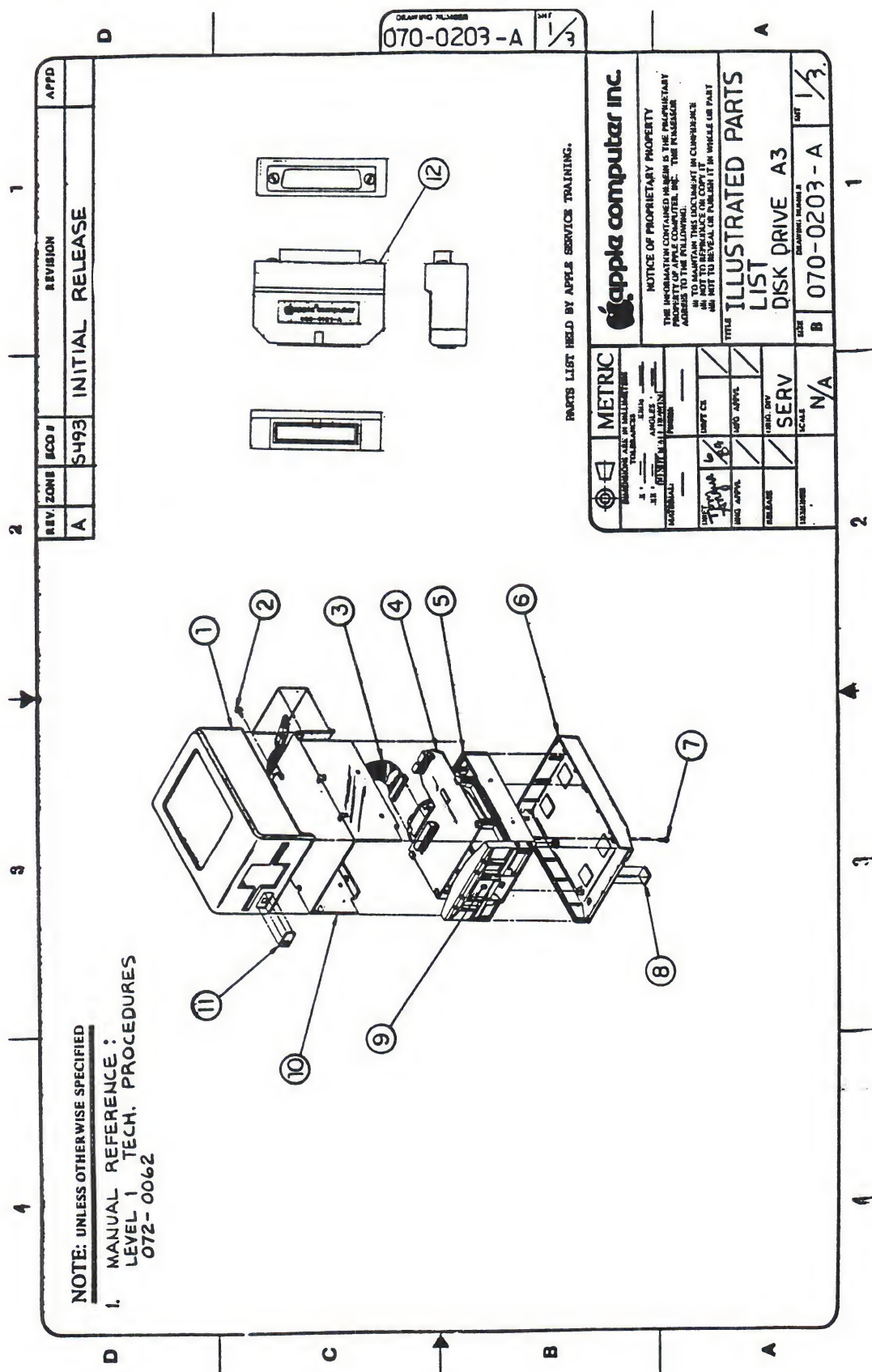
### Section 3

#### Illustrated Parts List

The figures and lists below include all piece parts that can be purchased separately from Apple for the Disk Drive ///, along with their part numbers. These are the only parts available from Apple. Refer to your Apple Service Programs manual for prices.

#### Contents:

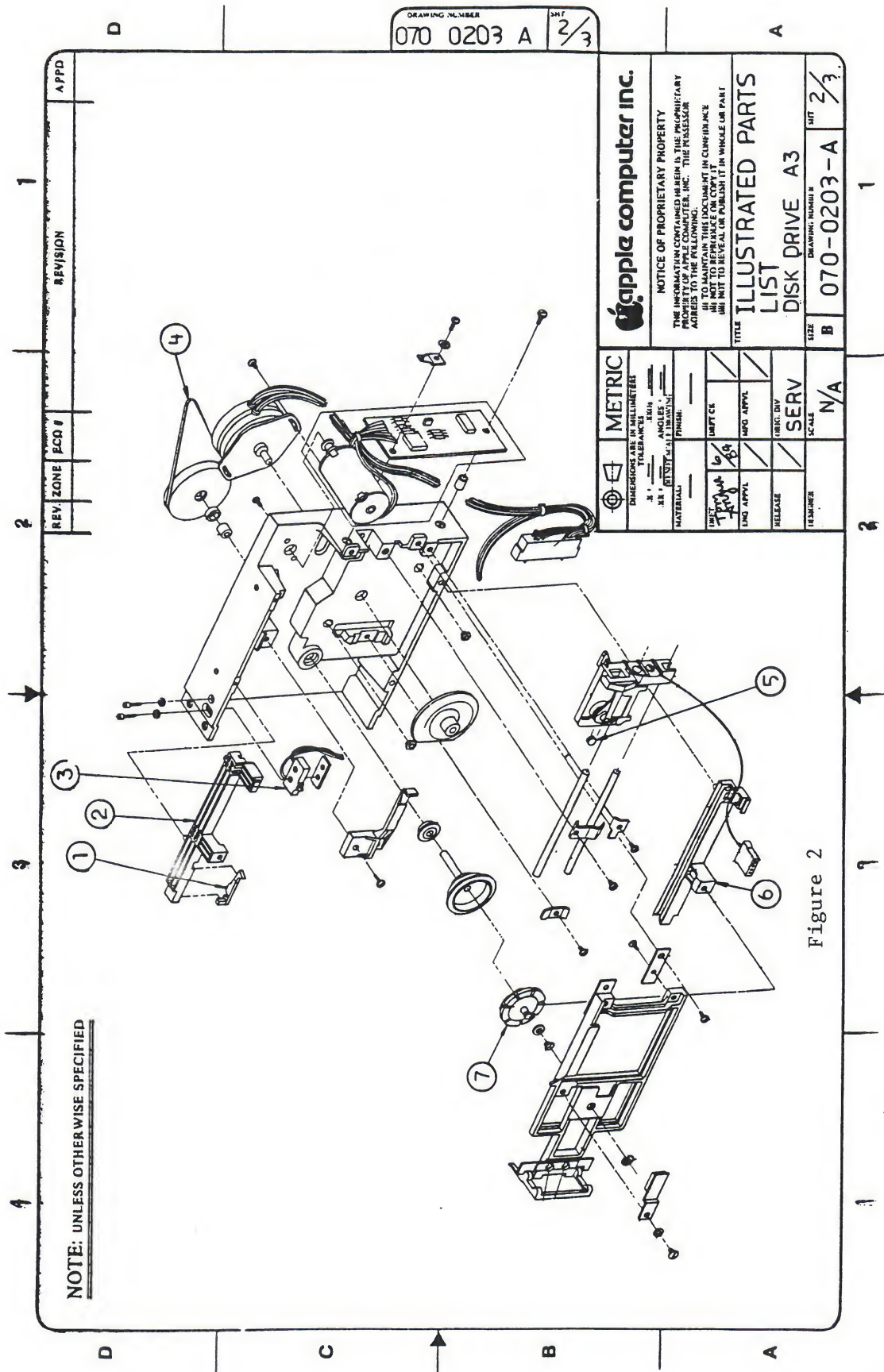
Illustrated Parts List.....	3.1
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# DISK DRIVE /// (Figure 1)

Item	Part No.	Description
1	815-0185	Disk /// Top Cover
2	430-1001	Screw Tapping 8x18.437, Disk ///
3	590-0024	Disk /// Cable
4	661-92002	Disk /// Analog Card
5	661-92015	Disk /// Mech Assembly, External
6	815-0186	Disk /// Bottom Cover
7	400-1606	Screw, 6-32x3/8, Disk ///
8	865-0001	Rubber Feet
9	815-0187	Disk /// Door
10	805-0037	Disk /// Shield
11	825-0069	Disk /// Label Front, Disk Logo
12	655-6101	Assy, PCB, Adapter, D3/A3+ (Service)





DISK DRIVE /// (Figure 2)

Item	Part No.	Description
1	815-0377	Write Protect Actuator (Alps)
	U815-0073	Write Protect Actuator (Shugart)
2	815-0081	Guide, Diskette (WRT-PRT) Alps
	U815-0072	Guide, Diskette (WRT-PRT) Shugart
3	U705-0005	Write Protect Switch DII-///
4	U880-0002	Disk Drive Belt
5	U815-0064	Load Button
6	815-0080	Guide, Diskette (Cable)
7	U815-0067	Collet Hub

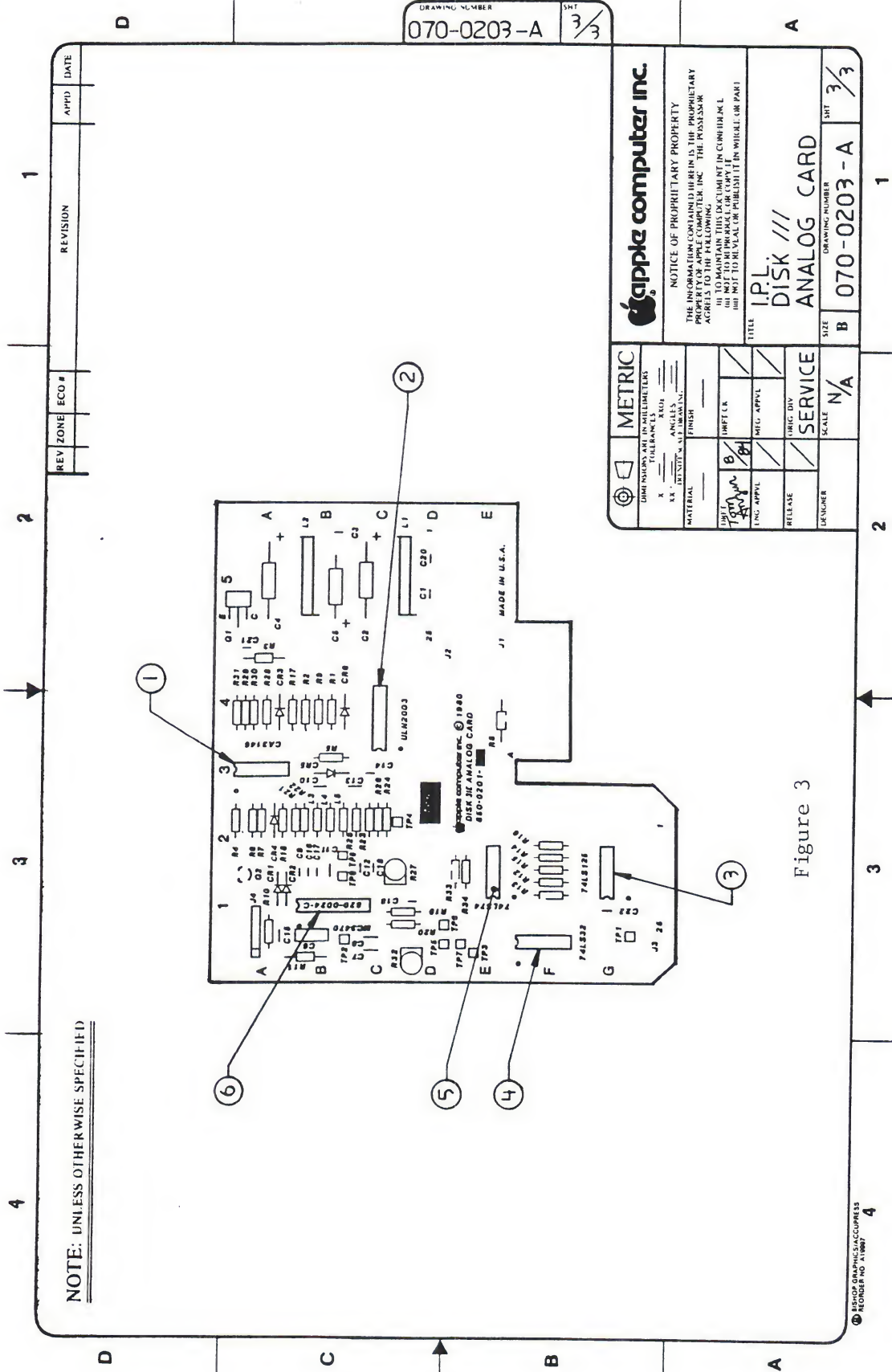


Figure 3



DISK DRIVE /// ANALOG CARD (Figure 3)

Item	Part No.	Description
1	352-3146	IC 3146
2	327-2003	IC 2003A
3	306-0125	IC 74LS125
4	305-0032	IC 74LS32
5	305-0074	IC 74LS74
6	355-3470	IC MC3470

